Military Relevant Respiratory Diseases

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Overview of Respiratory Infections

- Common source of morbidity
  - US Overall
    - 99 lost work days per 100 people per year
  - US Military
    - 25-30% of all infectious disease hospitalizations

Overview

- Military trainees appear at increased risk for respiratory infections
  - < 1 year of service = 5 x more likely to be hospitalized
  - New recruits = 29 x more likely
- Risk related to:
  - Stresses of training
  - Environmental factors
  - Close contact with new people

Overview

Key to prevention of acute respiratory diseases in military populations is preventing droplet and fomite transmission:

1. Providing facilities for frequent handwashing
2. Providing living areas with adequate space (3 feet) and ventilation
3. Head to foot sleeping arrangements

Key Pathogens:

- Viruses
  - Adenovirus
  - Influenza
  - Respiratory Syncytial Virus (RSV)
- Bacteria
  - *Streptococcus pneumoniae*
  - *Streptococcus pyogenes* (Group A Strep)
  - *Mycoplasma pneumoniae*
  - *Chlamydia pneumoniae*
  - *Bordetella pertussis*
- Fungi
  - *Coccidioides immitis*

Viruses

Adenovirus

- Year round respiratory virus
  - More common in late winter and early spring
- Medium sized virus
  - No envelope
  - Double-stranded DNA
- Hardy – prolonged life outside of body
- 49 serotypes

Adenovirus

- Spectrum of disease:
  - Common cold
  - Bronchitis
  - Pneumonia
  - Croup
  - Asymptomatic colonization
- The most common respiratory virus isolated among military recruits

Adenovirus

- Symptoms:
  - Fever
  - Cough
  - Nasal Congestion
  - Sore Throat
- Some serotypes cause
  - GI Disturbance
  - Keratitis
  - Conjunctivitis
  - Rash

Adenovirus Transmission

- Direct Contact
- Fecal-oral
- Water-borne
  - Poorly chlorinated swimming pools
- Fomites
- Prolonged shedding from asymptomatic carriers

Military Impact of Adenovirus

- First recognized as a problem in military recruits in WWII
- Typical Impact
  - 3 training days lost
  - 10 days of respiratory symptoms

Military Impact of Adenovirus

- In the 1950's and 1960's:
  - Caused 10% of all recruit hospitalization
  - Explained 72% of all acute respiratory illness during winter months
  - Caused outbreaks with 50-80% attack rates

Adenovirus Vaccine

- Developed in 1960s
  - Live, oral vaccine
  - Serotypes 4 and 7
- 1971: All recruits began receiving the vaccine
- Adenovirus was “controlled” in military recruits for 25+ years
  - Febrile respiratory illnesses were < 1 case per 100 trainees per week

Adenovirus Vaccine

- Vaccine production was stopped by sole producer (Wyeth) in 1996
- Military had enough supply to vaccinate troops until 1999
- Febrile Respiratory illnesses increased to 2-3 cases/100 trainees per week starting in Oct 99

Adenovirus Now

- Recruits with respiratory symptoms who do not receive vaccine are:
  - 12 x more likely to have positive adenovirus culture
  - 41 x more likely to have serotypes 4 or 7

Adenovirus Now

- Since 1999 – 10-12% of all basic trainees affected
- 2 deaths reported in 2000

Adenovirus Diagnosis

- Culture
- Serology
- Antigen detection
- PCR

Adenovirus Prevention

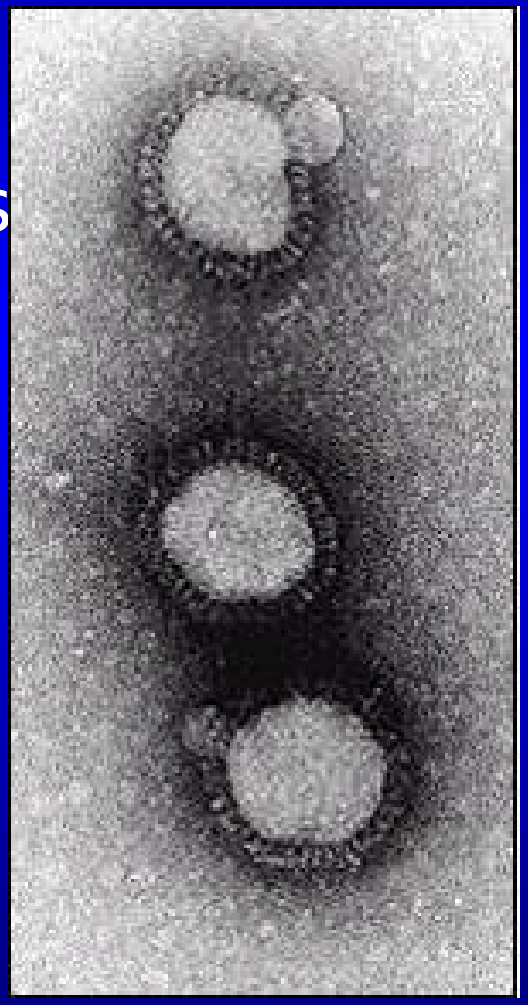
- No specific prevention

Adenovirus Treatment

- Supportive care only
- No specific anti-viral therapy

Influenza

- Respiratory Virus
- Generally winter months
- 10-20% of Americans affected each year
- Of these:
  - 36, 000 die
  - 114,000 hospitalized



Influenza History

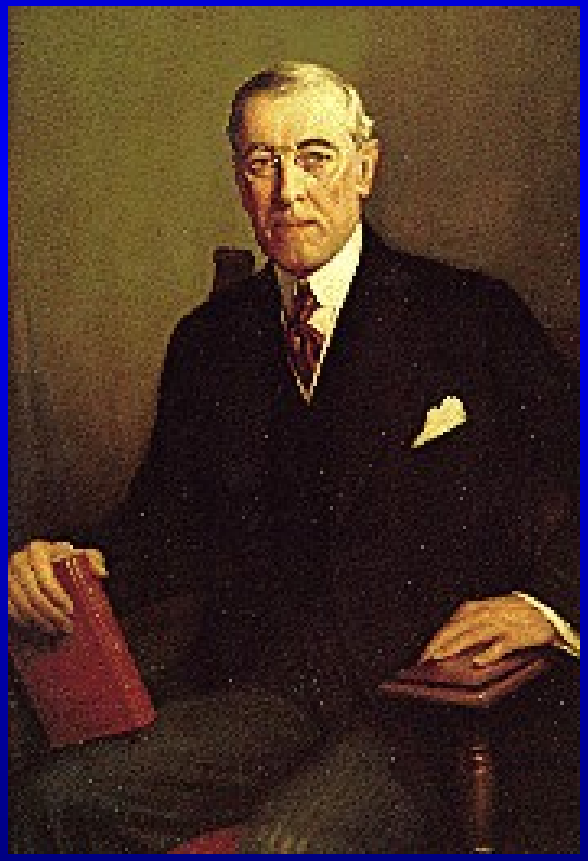
- Pandemic of 1918
- Killed 20 million world-wide

Influenza Trivia

Name a famous American who was one of the 20 million victims of this Influenza Pandemic

Influenza Trivia

Woodrow Wilson



Influenza Symptoms

- Fever
- Headache
- Malaise
- Dry cough
- Sore Throat
- Nasal Congestion
- Myalgia

Influenza Prevention

- Vaccination
  - Standard Injection
    - Over 65 or high risk
    - Health care workers
    - 6 months to 2 years
    - Pregnant women in 2nd and 3rd trimesters
  - New live attentuated vaccine
    - Administered nasally
    - 5 to 49 yo only
- Medications

Influenza Diagnosis

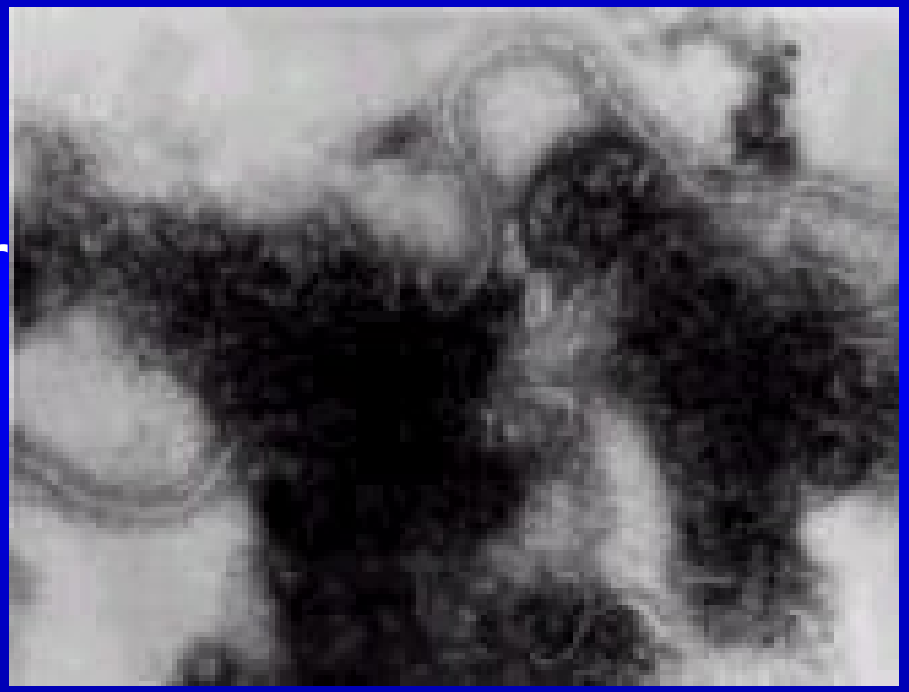
- Clinical
- Rapid Flu test
- Culture

Influenza Treatment

- Take within 48 hrs of onset
- Continue for 5 days
- Shorten duration of symptoms by 1-2 days
- Options:
  - Amantadine (A only)
  - Rimantadine (A only)
  - Oseltamivir
  - Zanamivir

Respiratory Syncytial Virus (RSV)

- Respiratory virus
- Enveloped, RNA vir
- Relatively unstable



Respiratory Syncytial Virus (RSV)

- Circulates Fall to Spring (Oct to April)
- Accounts for 10-15% of respiratory diseases in troops

RSV Transmission

- Direct Contact with secretions
- Fomites

RSV Spectrum of Disease

- Mild respiratory illness in adults
  - Common Cold
- Severe Disease in infants (< 6 weeks), premature and immunocompromised
  - Bronchiolitis
  - Pneumonia

RSV Symptoms

- Fever
- Cough
- Nasal Congestion
- Wheezing

RSV Prevention

- No specific prevention
- Vaccine research continues

RSV Treatment

- Supportive care
- Severe Disease = Ribavirin

Bacteria

Streptococcus pneumoniae

- A leading cause of morbidity and mortality
  - 500,000 cases per year in USA
- In the military
  - Caused 12% of pneumonia 1981-1991
  - Epidemics documented at
    - Camp Pendelton, CA 1990 & 2000
    - Fort Benning 1990 and 1999
    - US Navy ships off Italy 1991 (2 deaths)

S. pneumoniae Immunization

- Adult
  - 23-valent polysaccharide vaccine
  - Doesn’t really decrease cases of pneumonia, but decreases bacteremia
  - Given to recruits, but on going studies show no proven benefit in young adults...

S. pneumoniae Immunization

- Child
  - 7 valent polysaccharide vaccine conjugated to a protein
  - Appears to work substantially better than adult vaccine
  - Available since 2000

Therapy

- Emerging Resistance
- Military

  35% resistant to penicillin

  30% resistant to erythromycin

  27% resistant to 3 or more antibiotics
- BAMC 2002

  33% of isolates are Penicillin resistant

  25% resistant to erythromycin

Streptococcus pyogenes (Group A Strep)

- Strep Throat
  - Common in schools
  - Common outbreaks among recruits
  - 10 million cases/year in USA

Group A Strep

- Pharyngitis
  - Fever
  - Pharyngitis
  - Lymphadenopathy
  - Generally no rhinorrhea or cough
    - But does occassionally cause pneumonia
  - Self-limited disease

Group A Strep

- Therapy
- Penicillin
  - Decrease duration of symptoms
  - Decrease carrier state
  - Prevent sequelae (Rheumatic Fever)
- Erythromycins for Pen allergic

Group A Strep

- Acute Rheumatic Fever
  - Used to be common
  - Relatively rare since the introduction of Penicillin
  - 1000 cases/year in USA

Group A Strep

- Military epidemics first noted in WWII
  - Antibiotic Prophylaxis
    - Bicillin
    - Azithromycin
    - Erythromycin
  - Primary prophylaxis is sometimes used
  - Secondary prophylaxis more often utilized
    - Surveillance – Culture all pharyngitis cases
    - Antibiotics only given when rates are high

Group A Strep

- Invasive Group A Strep
  - Increased incidence since 1980s
  - 10,000 cases/year in USA
  - Severe, toxin mediated illness
  - May cause
    - Necrotizing Fasciitis
    - Streptococcal Toxic Shock Syndrome – 30% mortality

Group A Strep

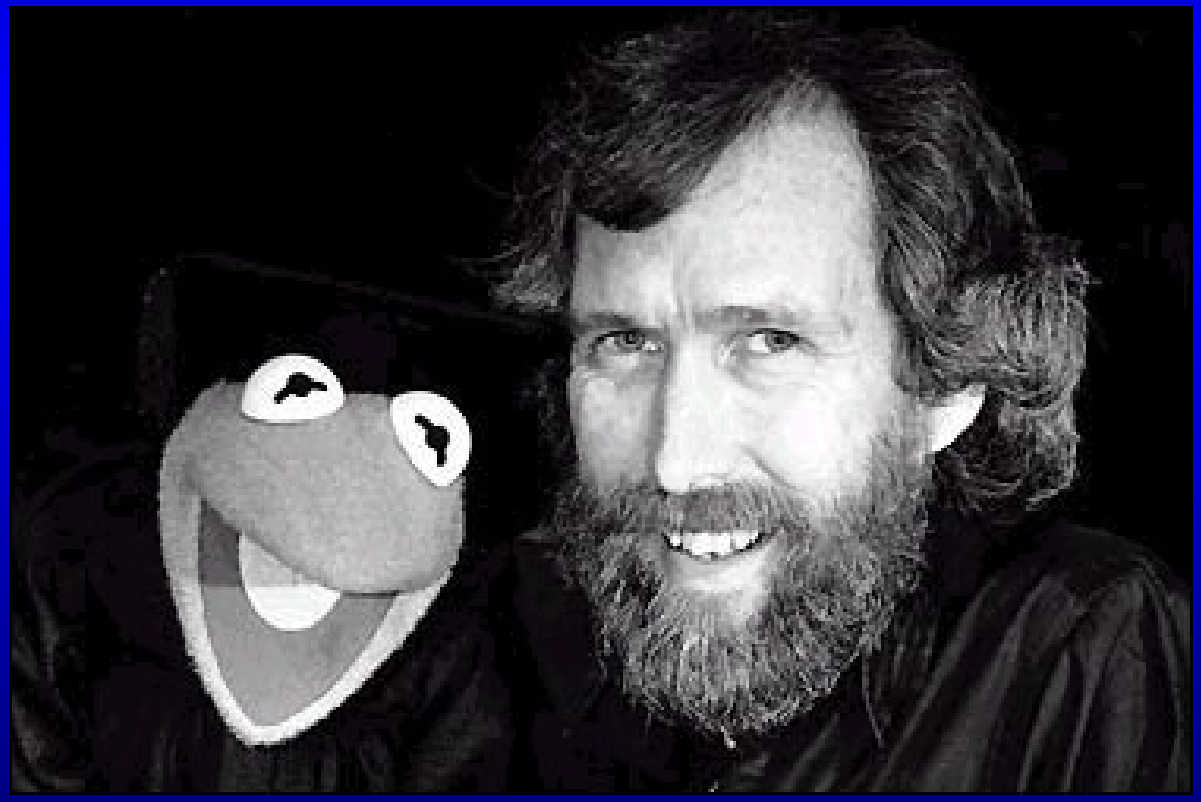
- Treatment of Invasive Group A Strep
  - Immediate surgical debridement
  - Penicillin
  - Clindamycin (stops toxin production)
  - IVIG

Group A Strep Trivia

Name a famous person
who died of a
severe Group A Strep infection

Group A Strep Trivia

Muppets creator Jim Henson



Mycoplasma pneumoniae

- Fever
- Non-productive cough
- Tracheobronchitis
- Pneumonia in up to 10%

Mycoplasma pneumoniae

- 2 million cases per year
- Transmitted by direct contact
- Outbreaks common in young adults particularly military recruits
- Dx: serology and PCR – no culture
- RX: Erythromycins or Fluoroquinolones

Chlamydia pneumoniae

- Little to no fever
- Cough
- Bronchitis
- Pneumonia
- Incidence unknown

Chlamydia pneumoniae

- Transmitted by direct contact
- Outbreaks common in children young adults particularly military recruits
- Dx: serology and PCR – no culture
- RX: Erythromycins or Fluoroquinolones

Bordetella pertussis

- Gram negative coccobacillus
- Paroxysmal spasms of
  - Coughing
  - Whooping
  - Posttussive vomiting
- Prolonged symptoms x several weeks
- 10% of prolonged cough illness in recruits

Bordetella pertussis

- Transmission: Direct contact with secretions
- Highly contagious
- Vaccine: “P” in DPT
- US incidence
  - Increasing since 1980’s
    - Unvaccinated children
    - Waning immunity in adults
  - 5-7,000 cases/year
  - 15 children died in 2002

Fungi

Coccidioides immitis

- Dimorphic fungus
- Found in Southwestern USA from desert areas of Texas to California and Mexico
- Particularly a problem at Fort Huachuca and Fort Irwin

Symptoms

- Valley Fever
  - Mild self-limited febrile respiratory illness
  - Chronic granulomatous changes on CXR
- Certain populations at risk for severe disease
  - Pregnant women
  - Asian – particularly filipino
  - African-Americans
  - Immune suppression particularly AIDS

Severe Disease

- Forms include:
  - Meningitis
  - Osteomyelitis
  - Cutanaeous

Treatment

- Mild Disease
  - None
- Severe Disease
  - Fluconazole
  - Prolonged to life-long course

Coccidioidomycosis Trivia

Name the Spurs player

who developed meningeal coccidioidomycosis

Coccidioidomycosis Trivia

Johnny Moore

Position: Point Guard

Retired Number: 00

A Real Military Outbreak

- Marine Corps Recruit Depot (MCRD)
- 4500 Recruits
- San Diego Nov 1 – Dec 20, 2002
- 160 recruits hospitalized with pneumonia

MMWR Feb 14, 2003

A Real Military Outbreak

- Etiologies included:
  - 31 (24.2%) Group A Strep
  - 25 (19.5%) *Mycoplasma pneumoniae*
  - 19 (14.8%) *Chlamydia pneumoniae*
  - 5 (3.9%) Adenovirus
  - 2 (1.6%) *Streptococcus pneumoniae*
  - 50 (39.1%) Unknown

MMWR Feb 14, 2003

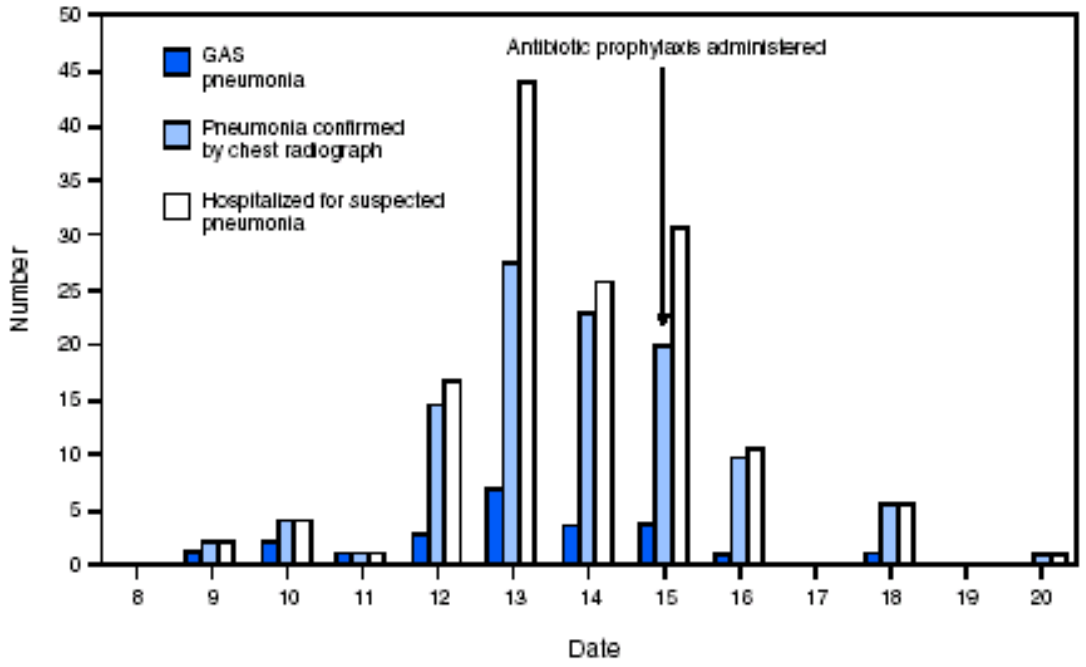
A Real Military Outbreak

- All new recruits had received primary prophylaxis upon arrival
- On Dec 15th all 4,500 recruits received prophylaxis again
- Outbreak was interrupted

MMWR Feb 14, 2003

A Real Military Outbreak

FIGURE. Number of persons with Group A streptococcus (GAS) pneumonia*, with pneumonia confirmed by chest radiograph†, and with suspected pneumonia§, by date of hospitalization — San Diego, California, December 8–20, 2002¶



*n = 24.
†n = 110.
§n = 143.
¶During November 1–December 7, 2002, an additional 20 Marine Corps recruits were hospitalized for suspected pneumonia. For 18 patients, pneumonia was confirmed by chest radiograph; seven cases were caused by GAS.

Summary

- Wash your hands!
- Educate troops to wash their hands!